New and Renewable Energy in Thailand

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General Information

Thailand’s Energy Situation and Policy

Geothermal energy in Thailand
General Information of Thailand

- **Capital and largest city:** Bangkok
- **Time zone:** UTC+7 (ICT)
- **Official languages:** Thai
- **Population:** 2018: 69.42 million
- **Currency:** Baht (THB)
- **Land Area:** 510,890 Km²

Source: [https://www.wpmap.org](https://www.wpmap.org)
Thailand’s Energy Situation and Policy
FINAL ENERGY CONSUMPTION BY FUEL TYPE 2018

- Petroleum Products: 41,383 ktoe (49%)
- Electricity: 16,805 ktoe (20%)
- Renewable Energy: 7,919 ktoe (10%)
- Coal & Its Products: 6,865 ktoe (8%)
- Natural Gas: 5,211 ktoe (6%)

Total Energy Consumption (2018): 83,952 ktoe
Final Energy Consumption by Economic Sector 2018

- Industrial: 35%
- Agricultural: 8%
- Transportation: 38%
- Commercial: 7%
- Residential: 12%
Total energy production in 2018: 72,609 ktoe
Thailand Integrated Energy Blueprint

- PDP: Power Development Plan
- EEP: Energy efficient Plan
- AEDP: Alternative Energy Development plan
- GAS: Gas plan
- OIL: Oil plan
## Power Development Plan 2018

### Reliability
- Consider the whole country electric system including generation, transmission and distribution
- Give priority to renewable energy, import power and gas-fired generation especially LNG
- Increase system balance in regional level
- Maintain generation level of major power plants for stability to support increasing renewable energy
- Increase grid flexibility

### Economic
- Electricity tariff form PDP 2018 will not be higher than current tariff
- Promote competitive cost generation
- Promote investment and stimulate regional economic by expanding investment in power plant to regional level

### Social & Environment
- Maintain generation from renewable energy to comply with COP 21
- Promote waste to energy
- Promote residential solar
### PDP 2018

<table>
<thead>
<tr>
<th>Fuel</th>
<th>PDP 2015 (2036)</th>
<th>PDP 2018 (2037)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas</td>
<td>37</td>
<td>53</td>
</tr>
<tr>
<td>Coal/lignite</td>
<td>23</td>
<td>12</td>
</tr>
<tr>
<td>Import Energy</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>Renewable energy</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Nuclear</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>Other fuel</td>
<td>0.1</td>
<td>6</td>
</tr>
<tr>
<td>EE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE type</td>
<td>Target (MW)</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>Solar</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>Biomass</td>
<td>3,376</td>
<td></td>
</tr>
<tr>
<td>Biogas</td>
<td>546</td>
<td></td>
</tr>
<tr>
<td>Floating solar + Hydro</td>
<td>2,725</td>
<td></td>
</tr>
<tr>
<td>Wind</td>
<td>1,485</td>
<td></td>
</tr>
<tr>
<td>Industrial waste</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>18,176</td>
<td></td>
</tr>
</tbody>
</table>
AEDP 2015 - Targets

Overall Targets

Renewable Energy in total energy consumption

By 2036

30%

Electricity

19,684.4 MW

Heat

25,088 ktoe

Fuel

11.3 MLPD Ethanol
14 MLPD B100

+0.53 MLPD Pyrolysis Oil
+4,800 TPD of CBG

Wind
Hydro
Waste
Solar
Biomass
Biogas

Compressed Biogas

Ethanol
Biodiesel
Share of Alternative Energy Consumption in 2018

<table>
<thead>
<tr>
<th>Alternative Energy Consumption</th>
<th>Quantity (ktoe)</th>
<th>Growth (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2015</td>
<td>2016</td>
</tr>
<tr>
<td>1. Electricity (Solar, Wind, Hydro, Biomass, MSW and Biogas)</td>
<td>1,556</td>
<td>2,122</td>
</tr>
<tr>
<td>1. Heat (Solar, Biomass, MSW and Biogas)</td>
<td>6,579</td>
<td>7,182</td>
</tr>
<tr>
<td>1. Biofuel Ethanol Biodiesel</td>
<td>879 1,063</td>
<td>684 1,063</td>
</tr>
<tr>
<td>Total</td>
<td>10,077</td>
<td>11,051</td>
</tr>
</tbody>
</table>
Overall target: **30%** by 2037

Renewable Energy in total energy consumption

<table>
<thead>
<tr>
<th>Sector</th>
<th>AEDP 2015</th>
<th>AEDP 2018</th>
<th>Differ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>4.27 %</td>
<td>5.86%</td>
<td>1.59%</td>
</tr>
<tr>
<td>Heat</td>
<td>19.15 %</td>
<td>21.12 %</td>
<td>1.97 %</td>
</tr>
<tr>
<td>Transportation</td>
<td>6.65 %</td>
<td>3.04 %</td>
<td>-3.61 %</td>
</tr>
<tr>
<td>Total</td>
<td>30.07 %</td>
<td>30.02 %</td>
<td>-0.05 %</td>
</tr>
</tbody>
</table>
Supporting Measures

- Feed in tariff
- BOI (Board of Investment)
- ESCO fund
- Data support
Geothermal energy in Thailand
There are 118 hot springs in Thailand. They are founded in the northern, western and southern part of the country.
Geothermal Energy in Thailand

The surface temperature ranges of 40-100 °C

The hot springs in northern Thailand are suitable for small scale power plant.

Geothermal resources in Thailand are classified into low-medium enthalpy.

The hot springs in western and southern Thailand are low enthalpy which suitable for agricultural, tourist attraction and therapy bath.
History of Geothermal Energy in Thailand

1977
• Geothermal energy have been studied in Northern Thailand by Chiang Mai University (CMU), the Electricity Generating Authority of Thailand (EGAT) and the Department of Mineral Resources (DMR)

1982-1989
• The EGAT and the Japan International Cooperation Agency (JICA) established technical collaboration to define geothermal potential at the San Kamphaeng geothermal field, Chiang Mai province
History of Geothermal Energy in Thailand

1987

- A pilot project for utilization of geothermal energy to generate 300 kW electricity at the Fang geothermal field, Chiang Mai province. (under cooperative between EGAT and the Bureau de Recherches Geologiques et Mineres (BRGM) of France)

1994-1996

- EGAT investigated geothermal potential at the Muang Rae and Nuang Paeng in the Pai district, Mae-Hong-son province. The result showed that these areas are suitable for agricultural purposes.
There are 3 hot spring systems in Thailand

<table>
<thead>
<tr>
<th>Hot spring system</th>
<th>Surface temperature (degree Celsius)</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot spring system</td>
<td>80 – 90</td>
<td>Northern</td>
</tr>
<tr>
<td>Warm spring system</td>
<td>40 -80</td>
<td>Most of the hot springs in Thailand</td>
</tr>
<tr>
<td>Geyser system</td>
<td>90 -100</td>
<td>The hot springs in Chiang Mai and Chiang Rai province</td>
</tr>
</tbody>
</table>
Geochemical Characteristics

Thermal water discharges from hot springs:

- Clear
- Colorless
- pH ranges from 6.4 – 9.5
- Derived from meteoric water and rain, infiltrated through underground
- Receives heat transfer from hot rock then heated up and exposed to surface
<table>
<thead>
<tr>
<th>Geothermal Power Plant</th>
<th>December 1989: <strong>Fang geothermal</strong> is the first geothermal power plant in Thailand using binary cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A joint technical cooperation project between the BRGM, Geowatt of France and EGAT</td>
</tr>
<tr>
<td></td>
<td>Inlet vaporizer temperature after passing through air released tank: 115- 120 °C</td>
</tr>
<tr>
<td></td>
<td>Hot water released from vaporizer outlet: 80 °C</td>
</tr>
<tr>
<td></td>
<td>Output: 300 kW (connected to grid + provided 1.2 million kWh annually)</td>
</tr>
</tbody>
</table>
A 300 kW Binary Cycle Power Plant
EGAT started construction of Fang Geothermal Power Plant. Apart from power generation, the geothermal power here is applied for drying agricultural crops such as onion, garlic, longan, and chilli. Moreover, the excessive hot water is used for physical therapy in the mineral bathing room.
Direct Uses

Drying process: Sankamphaeng geothermal field: curing and drying banana, chili, garlic, maize etc.

- **Cooling storage Process:** (1988) using absorption refrigeration system with 24,000 btu/hr and temperature at 4 °C for storing agricultural products: lemon, onion and lichee.

Public Water and Recreational Ground: suitable for therapeutic bathing
Hot spring at San Kampaeng
Thank you